CLAIMS

What is claimed is:

1. An electrical machine having an output rating, the electrical machine comprising:

a shaft rotatable about an axis;

a rotor coupled to the shaft and rotating with the shaft, the rotor configured to include a first rotor portion when the output rating is a first rating and include a second rotor portion when the output rating is a second rating; and

a stator including a stator core having a fixed cross-sectional profile with respect to the axis, the stator core configured to be disposed adjacent to the first rotor portion when the output rating is the first rating and disposed adjacent to the second rotor portion when the output rating is the second rating.

2. The electrical machine of claim 1, wherein the second rotor portion includes the first rotor portion.

3. The electrical machine of claim 2, wherein the rotor is configured to include a third rotor portion when the output rating is a third rating, the third rotor portion including the first and second rotor portions, and wherein the stator core is configured to be disposed adjacent the third rotor portion when the output rating is the third rating.

4. The electrical machine of claim 3, wherein the first output rating is a one-half horsepower rating, the second output rating is a three-quarter horsepower rating, and the third output rating is a one horsepower rating.

5. The electrical machine of claim 1, wherein the first rotor portion includes a first one or more axial sections, the number of the first one or more axial sections being represented by (x) where (x) is an integer greater than zero, the first one or more axial sections having a relation to the first output rating, and wherein the second rotor portion includes a second one or more axial sections, the number of the second one or more axial sections being represented by (y) where (y) is an integer greater than (x), the second one or more axial sections having a relation to the second output rating.

6. The electrical machine of claim 5, wherein the stator core is disposed adjacent to the first one or more axial sections when the machine output rating corresponds to the first output rating, and the stator core is disposed adjacent to the second one or more axial sections when the machine output rating corresponds to the second machine output rating.

7. The electrical machine of claim 5, wherein the second one or more axial sections and the first one or more axial sections include at least one similar axial section.

8. The electrical machine of claim 5, wherein each of the axial sections has a magnetization pattern of alternating magnetic poles, and wherein, for each axial section, the magnetization pattern of the axial section is different than any adjacent axial section.

9. The electrical machine of claim 5, wherein each of the axial sections has a magnetization pattern of alternating magnetic poles skewed with respect to the axis, and wherein, for each axial section, the magnetization pattern of the axial section is different than any adjacent axial section.

10. The electrical machine of claim 9, wherein the axial sections substantially define a herringbone pattern in the axial direction with respect to the axis.

11. The electrical machine of claim 10, wherein the rotor has a periphery, and wherein the axial sections define an arc of skew (β) at the periphery.

12. The electrical machine of claim 10, wherein the rotor has a periphery, wherein the first one or more axial sections define a first arc of skew (β_1) at the periphery, and wherein the second one or more axial sections define a second arc of skew (β_2) at the periphery.

13. The electrical machine of claim 9, wherein the lengths of each axial section are approximately the same.

14. The electrical machine of claim 9, wherein the lengths of the first one or more axial sections are approximately the same, and wherein the lengths of the second one or more axial sections are approximately the same.

15. The electrical machine of claim 8, wherein the output rating is represented by (P_x), wherein the total length in the axial direction for the axial sections of the configured rotor is represented by (L_x), wherein (L_x) satisfies the relationship ($0.75 (P_x/P_m) \leq (L_x/L_m) \leq 1.5 (P_x/P_m)$), wherein ($P_m$) is a chosen maximum output rating for an electrical machine built with a stator core having the fixed cross-sectional profile, and wherein (L_m) is the length corresponding to the length of the rotor for the maximum output rating (P_m).

16. An electrical machine having an output rating (P_x), the electrical machine comprising:

a shaft rotatable about an axis;

a stator including a stator core and windings, the stator core having a fixed cross-sectional profile with respect to the axis; and

a rotor coupled to the shaft and adapted to magnetically interact with the stator, the rotor being configured to include one or more axial sections, the one or more axial sections define a total length (L_x) in the axial direction with respect to the axis,

where (L_x) satisfies the relationship $(0.75\ (P_x/P_m) \leq (L_x/\ L_m) \leq 1.5\ (P_x/P_m))$,

where (P_m) is a chosen maximum output rating for an electrical machine built with a stator core having the fixed cross-sectional profile,

where (L_m) is the length corresponding to the length of the rotor for the maximum output rating (P_m), and

where (P_x) is less than the maximum output rating (P_m).

17. The electrical machine of claim 16, wherein the number of the one or more axial sections is represented by (a), where (a) is an integer greater than zero and where (a) relates to the output rating (P_x).

18. The electrical machine of claim 17, wherein each of the axial sections has a magnetization pattern of alternating magnetic poles, and wherein, for each axial section, the magnetization pattern of the axial section is different than any adjacent axial section.

19. The electrical machine of claim 17, wherein each of the axial sections has a magnetization pattern of alternating magnetic poles skewed with respect to the axis and wherein, for each axial section, the magnetization pattern of the axial section is different than any adjacent axial section.

20. The electrical machine of claim 19, wherein the axial sections substantially define a herringbone pattern in the axial direction.

21. The electrical machine of claim 20, wherein the rotor has a periphery, and wherein the axial sections define at least one arc of skew (β) at the periphery.

22. The electrical machine of claim 17, wherein the lengths of each axial section are approximately the same.

23. The electrical machine of claim 17, wherein (P_x) is one of a defined number of ratings, the defined number being represented by (b), where (b) is an integer greater than zero.

24. The electrical machine of claim 23, wherein, when (P_x) is equal to (P_m), (a) is equal to (b).

25. The electrical machine of claim 23, wherein, when (P_x) is equal to (P_m), (a) is equal to (2b).

26. The electrical machine of claim 23, wherein, when (P_x) is equal to (P_m), (a) is equal to (2b - 1).

27. A method of manufacturing an electrical machine having a desired output rating (P_x), the electrical machine including a rotor and a stator, the rotor rotatable about an axis, the stator including a stator core and windings, the stator core having a fixed cross-sectional profile with respect to the axis, the method comprising the acts of:

producing the rotor including magnetizing the rotor to include a first one or more sections when the desired output rating (P_x) corresponds to a first output rating and magnetizing the rotor to include a second one or more sections when the desired output rating (P_x) corresponds to a second output rating;

producing the stator; and

assembling the motor.

28. The method of claim 27, and further comprising the acts of:

determining a total length (L_x) in the axial direction for the one or more axial sections based on the desired output rating; and

determining a length of the stator in the axial section to interact with the rotor.

29. The method of claim 28, wherein (L_x) satisfies the relationship $(0.75 (P_x/ P_m) \leq (L_x/ L_m) \leq 1.5 (P_x/ P_m))$, where ($P_m$) is a chosen maximum output rating for an electrical machine built with a stator core having the fixed cross-sectional profile, and where (L_m) is the length corresponding to the length of the rotor for the maximum output rating (P_m).

30. The method of claim 29, wherein the length of the stator has a relation to the desired output rating.

31. The method of claim 28, wherein producing the stator includes stacking laminations of magnetic material to produce the stator core.

32. The method of claim 27, wherein the second one or more axial sections includes the first one or more axial sections.

33. The method of claim 27, wherein each of the axial sections has a magnetization pattern of alternating magnetic poles, and wherein, for each axial section, the magnetization pattern of the axial section is different than any adjacent axial section.

34. The method of claim 27, wherein each of the axial sections has a magnetization pattern of alternating magnetic poles skewed with respect to the axis, and wherein, for each axial section, the magnetization pattern of the axial section is different than any adjacent axial section.

35. The method of claim 34, wherein the magnetized axial sections substantially define a herringbone pattern in the axial direction.

36. The method of claim 35, wherein the rotor has a periphery, and wherein the magnetized axial sections define at least one arc of magnetization skew (β) at the periphery.

37. The method of claim 35, wherein the lengths of each magnetized axial section are approximately the same.

38. The method of claim 27, wherein the number of the one or more magnetized axial sections is represented by (a), where (a) is an integer greater than zero, and wherein (P_x) is one of a defined number of ratings, the defined number being represented by (b), where (b) is an integer greater than zero.

39. The method of claim 38, wherein, when (P_x) is equal to (P_m), (a) is equal to (b).

40. The method of claim 38, wherein, when (P_x) is equal to (P_m), (a) is equal to (2b).

41. The method of claim 38, wherein, when (P_x) is equal to (P_m), (a) is equal to (2b - 1).

42. A method of manufacturing an electrical machine having an output rating (P_x), the electrical machine including a stator and a rotor, the stator including a stator core and windings, the stator core having a fixed cross-sectional profile with respect to the axis, the method comprising the acts of:

producing the rotor including magnetizing the rotor to include a plurality of axial sections; and

producing the stator including

producing the stator core with a first axial length when the desired output rating (P_x) corresponds to a first output rating and

producing the stator core with a second axial length when the desired output rating (P_x) corresponds to a second output rating; and

assembling the motor.

43. The method of claim 42, wherein assembling the motor comprises

aligning the stator core with a first one or more axial sections of the rotor when the desired output rating corresponds to the first output rating; and

aligning the stator core with a second one or more axial sections of the rotor when the desired output rating corresponds to the second output rating.

44. The method of claim 43, wherein the second one or more axial sections includes the first one or more axial sections.

45. The method of claim 42, wherein the length of the stator core is represented by (L_x), wherein (L_x) satisfies the relationship $(0.75\ (P_x/ P_m) \leq (L_x/ L_m) \leq 1.5\ (P_x/ P_m))$, wherein ($P_m$) is a chosen maximum output rating for an electrical machine built with a stator core having the fixed cross-sectional profile, and wherein (L_m) is the length corresponding to the length of the stator core for the maximum output rating (P_m).